

# The Contrastive Analysis of China's Bond Financing and Stock Financing

—Based on PVAR Model

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## Abstract

Through the establishment of the panel vector autoregressive model (PVAR), taking the 31 provincial panel data from the fourth quarter of 2013 to the second quarter of 2018 as research samples, the empirical test on the regional effects of bonds and stocks on social financing is carried out. The results show that the impact of bonds on social financing is greater than the impact of stocks on social financing. Compared with the economically less-developed regions and economically underdeveloped regions, the social financing in economically developed regions is the most sensitive to bonds and stocks. And the bonds and stocks in economically developed regions have a greater and far-reaching impact on social financing.

## Keywords

Bond, Regional Effect, PVAR

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## 1. Introduction

Over the past two decades, China's financial market has achieved great development, and the types of financial instruments continue to increase. However, compared with developed countries and even some emerging market countries, there is still a big gap. Therefore, increasing the innovation intensity of financial instrument is of great significance for realizing the internationalization of China's financial market. While expanding bond issuance is of great significance to China's multi-level financial system construction, increasing the proportion of direct financing and reducing the fragility of the financial system.

## 2. Literature Reviewed

Zhang Sheng [1] summarized the comparative advantages of corporate bond financing based on the analysis of western corporate financing theory, and conducted empirical research based on the current situation of China's financing market. The empirical results show that the cost advantage of Chinese listed companies' corporate bond financing is not significant, but the financing "signal" transmission effect is obvious. Shi Wenchao [2] constructed a regression model by the relationship between money supply in wide sense, loan balance and the amount of bond custody. It is concluded that the direct debt financing market can effectively reduce the currency derivation effect of the total financing behavior of the society, and the injection of funds into the real economy has an incomparable certainty in the credit market. Ji Chengpeng [3] used the panel data of 37 countries from 1991 to 2010 to study the relationship between the development of the bond market and the net inflow of bond capital. Finding the size of a country's bond market is an important factor in attracting net inflows of bond capital. Gu Xian [4] found that in countries with stronger creditor rights protection, its enterprises tend to issue bond financing, and the resulting proportion of capital investment is higher; Conversely, in countries with weaker creditor rights protection, the lower the proportion of enterprises through bond financing, the lower the level of capital investment.

From the above literature, we can hardly see the use of PVAR model in measuring the financing ability of bonds and stocks and examining the regional effects of bonds and stocks on social financing. Therefore, based on Generalized Methods of Moments, Impulse Response and Variance Decomposition, which can preferably measure the short-term and long-term dynamic relationship among variables, this thesis empirically analyzes the impact of bonds and stocks on social financing to measure difference of the financing ability of bonds and stocks in financial markets, and this paper examines the regional effects of bonds and stocks on social financing in order to measure difference of the financing ability of bonds and stocks under different economic background. Ultimately, proposing relevant countermeasures and suggestions.

## 3. Data Description and Model Assumptions

### 3.1. Data Selection

The data sample is the quarterly data of 31 provinces, autonomous regions and municipalities in China from the fourth quarter of 2013 to the first quarter of 2018. The data comes from the statistics database of China Economic and Trade Network. This paper uses STATA14.0 statistical software to analyze the relevant data. In order to study the regional effects of bonds, it refers to the "China Marketization Index" compiled by Fan Gang, etc. in 2010 and the results of Xiong, Qiyue and Zhang Yiru [5] (2012). The provinces in the sample are divided into three regions according to the degree of economic development: economically developed regions, economically less-developed regions, and economically un-

derdeveloped regions<sup>1</sup>.

### 3.2. Theory Model

The Panel Vector Auto Regression [6] model is used in the study of this thesis to examine the regional effects of China's bond financing ability.

$$Z_{it} = \Gamma_0 + \sum_{p=1}^n \Gamma_p Z_{it-p} + f_i + e_i \quad (1)$$

Therein,  $Z_{it} = (Lnfin_{it}, Lnbond_{it}, Lnstock_{it})$ .  $\Gamma_0$  is estimated parameter matrix,  $f_i$  represents the cross-sectional effect of each region,  $e_i$  represents the time effect. The dependent variable of this thesis is  $Lnfin_{it}$ ,  $Lnfin_{it}$  represents the social financing increment of  $i$  province in  $t$  quarter, the independent variable is  $Lnbond_{it}$  and  $Lnstock_{it}$ ,  $Lnbond_{it}$  represents the bond volume of  $i$  province in  $t$  quarter,  $Lnstock_{it}$  represents the stock volume of  $i$  province in  $t$  quarter. In order to eliminate the heteroscedasticity, all variables are taken logarithm here.

## 4. Empirical Analysis

### 4.1. Establishment and Estimation of PVAR Model

In the practical application of vector auto regressive model, it is usually desirable to have a large enough lag order to more fully reflect the constructed dynamic features. However, the longer the lag order, the more parameters to be estimated in the model, and the less the degree of freedom. Therefore, in order to find a kind of equilibrium between the lag period and the degree of freedom, we use the AIC, BIC and HQIC information criteria to judge the optimal lag order of the model. There are three variables of statistical characteristic description, which are sample numbers, mean values, standard deviation, minimum and maximum in **Table 1**. It can be seen from **Table 2** that the optimal lag order of the three models is finally determined to be 7th order. And on this basis, the model is estimated by GMM (Generalized Methods of Moments) to obtain short-term regression coefficients. The test results are shown in **Table 3**.

### 4.2. Impulse Response

Because the regression coefficient of the PVAR model is more, it is difficult to explain the continuous relationship between the various variables in the future phases. Therefore, the impulse response figure is used to directly describe the interaction relationship between the various variables in the next eight phases. It measures the short-term, purely unilateral impact of one variable on another variable by the impact of the unit standard deviation.

<sup>1</sup>Economically developed regions: Beijing, Tianjin, Shanghai, Jiangsu, Zhejiang, Shandong, Guangdong; economically less-developed regions: Hebei, Liaoning, Anhui, Fujian, Jiangxi, Henan, Hubei, Hunan, Guangxi, Sichuan, Xinjiang, Shanxi, Chongqing; economically underdeveloped regions: Inner Mongolia, Jilin, Heilongjiang, Hainan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai and Ningxia.

**Table 1.** Three variables of statistical characteristic description.

Regions	Variable	Obs	Mean	Std. Dev.	Min	Max
Economically developed regions	lnfin	126	13.24814	0.6898259	11.28606	14.60811
	lnbond	126	12.44276	1.13731	10.18148	14.5393
	lnstock	126	14.43384	0.9520874	11.73918	16.34245
Economically less-developed regions	lnfin	234	12.52914	0.6000615	9.998025	13.63475
	lnbond	234	10.96792	0.8446048	9.241491	12.96271
	lnstock	234	13.23357	0.7830954	11.18321	15.2293
Economically underdeveloped regions	lnfin	198	11.63472	0.8212371	9.584246	13.29227
	lnbond	198	9.716054	1.384953	5.313009	12.05144
	lnstock	198	11.69802	1.155796	7.70154	14.02911

**Table 2.** Optimal lag order.

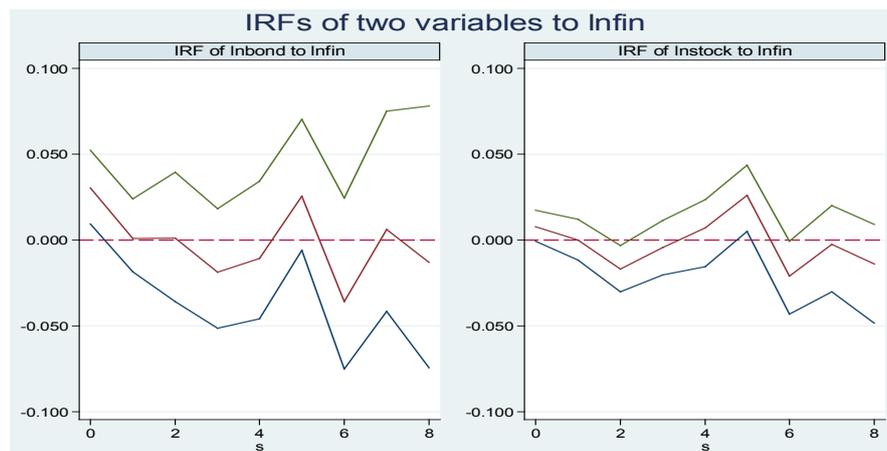
	Lag	AIC	BIC	HQIC
Economically developed regions	Lags = 7	-2.67751*	0.020688*	-1.60575*
	Lag	AIC	BIC	HQIC
Economically less-developed regions	Lags = 7	-1.65841*	0.591499*	-0.744199*
	Lag	AIC	BIC	HQIC
Economically underdeveloped regions	lags = 7	-0.66423*	1.69255*	0.291694*

**Table 3.** GMM estimation results of the model.

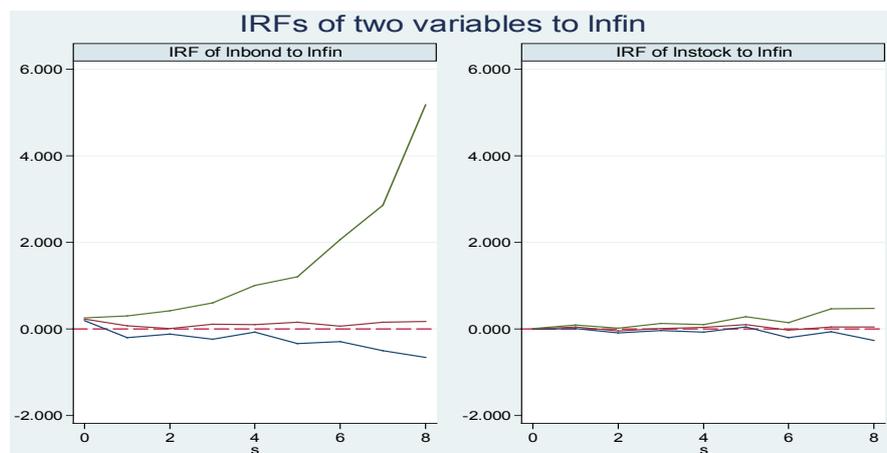
Regions	Economically developed regions (Lags = 7)	Economically less-developed regions (Lags = 7)	Economically underdeveloped regions (Lags = 7)
Variable	lnfin <sub>t</sub>	lnfin <sub>t</sub>	lnfin <sub>t</sub>
lnfin <sub>t-1</sub>	0.8300626 (0.000)	1.375004 (0.001)	0.6547289 (0.004)
lnbond <sub>t-1</sub>	0.4989317 (0.180)	-1.719016 (0.369)	0.1583622 (0.234)
lnstock <sub>t-1</sub>	-0.0955629 (0.813)	-2.561319 (0.337)	0.930139 (0.011)
lnfin <sub>t-2</sub>	0.0217652 (0.890)	0.1670232 (0.681)	-0.0036457 (0.981)
lnbond <sub>t-2</sub>	0.0888964 (0.705)	-0.1019287 (0.815)	-0.1418072 (0.220)
lnstock <sub>t-2</sub>	0.272253 (0.514)	-2.48489 (0.230)	-0.4169407 (0.013)
lnfin <sub>t-3</sub>	-0.3126097 (0.025)	-0.5006026 (0.052)	-0.1793157 (0.075)
lnbond <sub>t-3</sub>	-0.0031204 (0.993)	-0.6263319 (0.253)	0.2800261 (0.013)
lnstock <sub>t-3</sub>	0.3840742 (0.055)	0.5483773 (0.203)	-0.4949852 (0.012)
lnfin <sub>t-4</sub>	1.021125 (0.000)	1.376413 (0.000)	0.7366465 (0.000)
lnbond <sub>t-4</sub>	0.0124789 (0.947)	-0.0762864 (0.841)	-0.2067342 (0.031)
lnstock <sub>t-4</sub>	-0.190674 (0.385)	0.1460985 (0.739)	0.2834112 (0.066)
lnfin <sub>t-5</sub>	-0.5646956 (0.000)	-0.3616894 (0.483)	-0.720417 (0.000)
lnbond <sub>t-5</sub>	0.0951607 (0.622)	0.0135447 (0.971)	-0.1163515 (0.226)
lnstock <sub>t-5</sub>	-0.3611191 (0.115)	-0.2553097 (0.454)	0.3428032 (0.069)
lnfin <sub>t-6</sub>	-0.2655326 (0.265)	0.477432 (0.378)	0.1350886 (0.328)
lnbond <sub>t-6</sub>	-0.0110993 (0.952)	-0.6426665 (0.224)	0.0151846 (0.871)
lnstock <sub>t-6</sub>	0.4830834 (0.009)	-0.0467358 (0.877)	-0.4568621 (0.002)
lnfin <sub>t-7</sub>	0.4270327 (0.014)	0.243103 (0.379)	-0.0532688 (0.727)
lnbond <sub>t-7</sub>	-0.3516738 (0.043)	0.1232818 (0.697)	0.0199586 (0.778)
lnstock <sub>t-7</sub>	-0.1970982 (0.237)	-0.4140846 (0.493)	0.2816893 (0.002)

The impulse response of social financing subject to one unit standard deviation positive impact of bonds and stocks is shown in **Figure 1**. It can be seen from the figure that the impact of bonds and stocks on social financing has a lag of one phase (*i.e.*, one quarter). Both bonds and stocks have the strongest promotion effect on the fifth phase of social financing in the future, and then the promotion effect has gradually become smaller. And bonds and stocks still have an impact on social financing in the eighth phase, indicating that bonds and stocks have a longer-lasting impact on social financing. However, as can be seen from the figure, the fluctuation amplitude of the impulse response graph of bonds to social financing is larger than that of stocks to social financing, indicating that the impact of bonds on social financing is greater than the impact of stocks on social financing.

It can be seen from **Figure 2** that the impulse response of social financing subject to one unit standard deviation positive impact of bonds is greater than the impulse response of social financing by one unit standard deviation positive impact of stocks. And the shock of bonds and stocks on social financing is positive, but the impact of bonds and stocks on social financing is not significant.



**Figure 1.** Impulse response figure of developed regions.



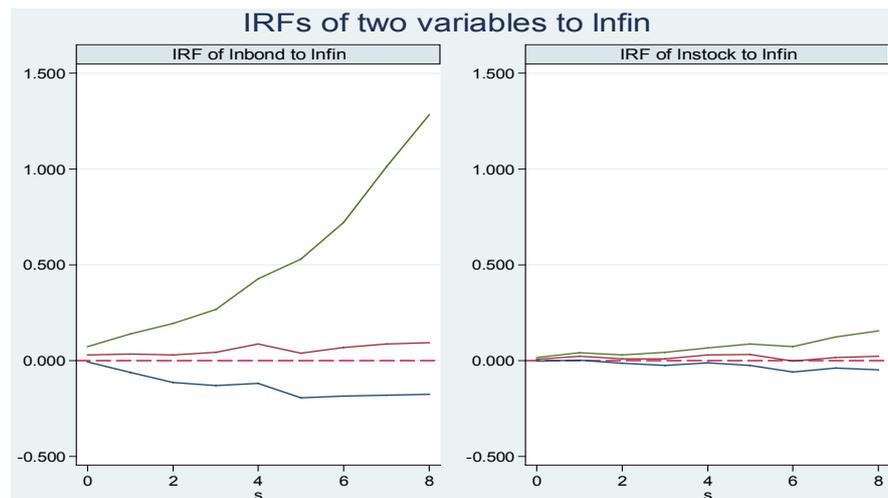
**Figure 2.** Impulse response figure of less-developed regions.

It can be seen from **Figure 3** that the impulse response of social financing subject to one unit standard deviation positive impact of bonds is greater than the impulse response of social financing by one unit standard deviation positive impact of stocks. The shock of bonds and stocks on social financing is positive but not significant.

### 4.3. Variance Decomposition

Using the PVAR model, it is also possible to perform dynamic analysis of the variance decomposition study model. The main idea is to decompose the fluctuations (k prediction mean square error) of each endogenous variable (m in total) in the system into m components associated with the information of each equation according to their formation, so as to understand the relative importance of information to the model endogenous variables.

**Table 4** shows the variance decomposition results of social financing on bonds and stocks in the three economic regions. From the perspective of the contribution degree of 1 unit fluctuation in social financing increment, in the three economically developed regions, the contribution rate of bonds to the social financing is greater than the contribution rate of stocks to social financing.



**Figure 3.** Impulse response figure of underdeveloped regions.

**Table 4.** Sub-regional variance decomposition results.

Regions	Variable	s	Economically developed regions		Economically less-developed regions		Economically underdeveloped regions	
			Lnbond	Lnstock	Lnbond	Lnstock	Lnbond	Lnstock
	Lnfin	4	0.081	0.004	0.213	0.067	0.060	0.026
	Lnfin	8	0.125	0.013	0.335	0.066	0.067	0.036
	Lnfin	12	0.133	0.021	0.352	0.056	0.079	0.043
	Lnfin	16	0.138	0.026	0.348	0.051	0.094	0.048
	Lnfin	20	0.141	0.028	0.344	0.050	0.102	0.053

For economically developed regions, the contribution rate of bonds and stocks to social financing has slowly increased as time goes by. For economically less-developed regions, the contribution rate of bonds to social financing is the largest in the 12th period, and the contribution rate of stocks to social financing is gradually decreasing as time goes by. For economically underdeveloped regions, the contribution rate of bonds and stocks to social financing is constantly increasing.

## 5. Conclusion and Suggestion

It can be seen from the above analysis that the impact of bonds on social financing is greater than the impact of stocks on social financing. Compared with economically less-developed areas and underdeveloped areas, the social financing in economically developed regions is the most sensitive to bonds and stocks. And the bonds and stocks in economically developed regions have a greater and far-reaching impact on social financing. Also there is a certain time lag effect for the impact of bonds and stocks on social financing, and bond financing has a period of transmission process to have an impact.

It is not difficult to see that the influence of bonds on social financing should not be underestimated. Therefore, in the macroeconomic regulation and control, more attention should be paid to the development potential of bonds. Because the impact of bonds and stocks on social financing has obvious regional effects and certain time lag effects, in the macroeconomic regulation and control, differentiated macroeconomic countermeasures should be adopted, and regulation and control should be made timely and appropriately to avoid further economic gap growth in economically developed regions, economically less-developed regions and economically underdeveloped regions.

## Fund

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## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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